Arsenic: geochemical distribution and health risk in Italy

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Characterization of risks to human health is determinant for risk management and population surveillance. This study represent the first work at national scale for Italy about arsenic occurrence, distribution and health impact. We analyzed the As geochemical distribution in different environmental matrices on the whole Italian territory, and assessed both carcinogenic and non-carcinogenic risks for different exposure routes and age groups. The results demonstrate that, in Italy, arsenic is present in significant concentrations both in water (up to 27.2 μg/L) and soils (up to 70 mg/kg). Its presence is mainly controlled by geological processes and locally reflects the industrial history of the Country. The population of the Central Italy, where high content of arsenic in the analyzed samples is due to the presence of alkaline volcanics, are the most exposed to the health risk. Based on the results of our work, it is clear that the consumption of tap water for potable use is the most impactful route for As daily exposure and play an important role in governing potential cancer and non-cancer risks for the considered population. It is interesting to observe that the Incremental Life Cancer Risk through water ingestion show that almost 80% of data falls above the internationally accepted benchmark value of 1 x 10-5. Moreover it was demonstrated that childhood is the most susceptible age stage to As exposure. Geochemical mapping provided a useful tool to spatially analyze and represent data and to highlight the most critic areas and the most exposed population to arsenic at national scale. In conclusion, this study improve knowledge about As occurrence for an entire Country, recognizing an health emerging problem. It might be a good starting point to support the urgently needed policy actions, in order to prevent and reduce the health risk. Moreover, the performed method in this case study research is potentially generalizable and applicable in other countries.